EROSION AND SEDIMENTATION CONTROL/STORMWATER MANAGEMENT PLAN

RANGE RESOURCES – APPALACHIA, LLC

BEDNARSKI FRESH WATER IMPOUNDMENT
HOPEWELL TOWNSHIP
WASHINGTON COUNTY, PENNSYLVANIA

Prepared by:

RANGE RESOURCES – APPALACHIA, LLC
380 SOUTHEPOINTE BLVD., SUITE 300
CANONSBURG, PA 15317

September 2008

RECEIVING STREAM: BRUSH RUN (WWF) IN THE BUFFALO CREEK WATERSHED (HQ WATERSHED)

DISTANCE TO NEAREST STREAM: APPROX. 115 FT TO UNNAMED TRIBUTARY TO BRUSH RUN

NO ANTICIPATED WETLAND IMPACTS

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EROSION AND SEDIMENTATION CONTROL/STORMWATER MANAGEMENT PLAN

BEDNARSKI FRESH WATER IMPOUNDMENT
HOPEWELL TOWNSHIP, WASHINGTON COUNTY, PENNSYLVANIA

1.0 INTRODUCTION

Range Resources – Appalachia, LLC (Range) has prepared this Erosion and Sedimentation Control/Stormwater Management (E&S/SWM) Plan for the Bednarski Fresh Water Impoundment located in Hopewell Township, Washington County. The construction of this site includes the following:

- Construction of a fresh water impoundment; and
- Reclamation of the area following completion of the wells associated with this impoundment and returning the area to the original contours.

A site location map is included in Appendix A.

The proposed construction area is comprised of one drainage area which ultimately discharges to Brush Run. The drainage area is conveyed via sheet flow to an unnamed tributary to Brush Run, which is in the Buffalo Creek Watershed. According to the Chapter 93 Water Quality Standards, Department of Environmental Protection, Title 25 Environmental Resources, Commonwealth of Pennsylvania, Brush Run is classified as a Warm Water Fishery (WWF). The Buffalo Creek Watershed is a High Quality watershed.

This E&S/SWM Plan has been prepared in accordance with the requirements of the PADEP Erosion and Sediment Pollution Control Program Manual dated July 2001. The following sections of this plan present the qualifications of the plan preparer; type, slope, and extent of soils; amount of runoff; E&S/SWM controls; construction sequence; maintenance program; and references.

2.0 QUALIFICATIONS OF PLAN PREPARER

This E&S control plan was prepared by Carla L. Suszkowski, P.E. Ms. Suszkowski has over sixteen (16) years of experience in the preparation of E&S control and stormwater management plans for site development projects located in Pennsylvania, West Virgina, Virginia, Kansas, and Ohio. Ms. Suszkowski's record of training and experience is presented in Appendix E.

3.0 TYPE, SLOPE, AND EXTENT OF SOILS

According to the Soil Survey of Greene and Washington Counties, Pennsylvania, several soil types are present onsite. Figures showing the soils are provided in Appendix B. The soil types are addressed below.

CaD – Culleoka Silt Loam, 15 to 25% slopes:

The Culleoka series consists of moderately deep, well drained soils on uplands. They formed mostly in material weathered from siltstone or sandstone. Typically these soils have a brown silt loam surface layer 9 inches thick. The subsoil from 9 to 27 inches is brown channery silt loam and flaggy silt loam. The substratum from 27 to 33 inches is mottled strong brown and yellowish brown very flaggy silty clay loam.

DtD – Dormont-Culleoka Silt Loams, 15 to 25% slopes and
DtF – Dormont-Culeoka Silt Loams, 25 to 50% slopes:

The Culleoka series consists of moderately deep, well drained soils on uplands. They formed mostly in material weathered from siltstone or sandstone. Typically these soils have a brown silt loam surface layer 9 inches thick. The subsoil from 9 to 27 inches is brown channery silt loam and flaggy silt loam. The substratum from 27 to 33 inches is mottled strong brown and yellowish brown very flaggy silty clay loam.

The Dormont series consists of very deep, moderately well drained soils on uplands. They formed in residuum and colluviums consisting of shale, siltstone and some limestone. Typically these soils have a brownish silt loam surface layer 7 inches thick. The upper subsoil from 7 to 25 inches is a brown and yellowish brown silt loam. The pale brown and gray silty clay loam lower subsoil extends from 25 to 53 inches. The substratum from 53 to 72 inches is gray silty clay.

DoC – Dormont Silt Loam, 8 to 15% slopes:

The Dormont series consists of very deep, moderately well drained soils on uplands. They formed in residuum and colluviums consisting of shale, siltstone and some limestone. Typically these soils have a brownish silt loam surface layer 7 inches thick. The upper subsoil from 7 to 25 inches is a brown and yellowish brown silt loam. The pale brown and gray silty clay loam lower subsoil extends from 25 to 53 inches. The substratum from 53 to 72 inches is gray silty clay.

The limiting factors for the site soils have been considered when developing the proposed soil erosion and sedimentation control practices and construction sequences. Immediate seeding and mulching of disturbed areas will aid in soil stabilization and reduce soil erosion once vegetation is established.

The contractor shall take into account the soil encountered during earthmoving activities to establish that suitable material is utilized for the pond embankment construction. Caution should be used in areas where the soil is excessively wet or otherwise unsuitable for embankment construction. The contractor should use the cut and fill slopes designed on the drawings to prevent future issues and use standard construction practices for compaction of the embankment soils.

4.0 AMOUNT OF RUNOFF

The ground cover for the project area in the pre-construction condition is farmed cropland. For the purposes of this plan, the farmed cropland has been modeled as meadow, with a curve number (CN) of 70, representing a good vegetative stand. The ground cover in the post-construction condition will also be farmed cropland; therefore, there is no change from the pre-construction to post-construction conditions. As a result no stormwater calculations have been provided to compare the pre-construction and post-construction conditions.

The intermediate condition will include a lined fresh water impoundment. For the purposes of this plan, the stormwater calculations which have been performed for the psot-construction condition are the intermediate condition when the fresh water impoundment is in service.

The impoundment is approximately 290 feet by 350 feet at the top. The impoundment will be constructed with a cut slope on the east side and a fill slope on the west side. The fill slope around the impoundment is modeled with a CN of 82, representing soil with a poor vegetative stand. The area of the cut slope and the impoundment are not included in the post-construction stormwater calculations, due to the fact that any stormwater from these areas will be collected in the impoundment and will not run off the site. As a result, there will be no runoff from this 5.8 acres in the post-construction condition.

Worksheets 3, 4, and 5 from the Pennsylvania Department of Environmental Protection's Stormwater Best Management Practices Manual were used to determine the volume of stormwater runoff from the area for both pre-construction and post-construction conditions. Based on the results of the calculations on these worksheets (Appendix D), the volume of stormwater runoff from the 7.3 acres under pre-construction conditions is 13,331 ft^3. The volume of stormwater runoff from under post-construction conditions is 5,826 ft^3. Therefore, structural BMPs to control runoff are not required. Completed worksheets 3, 4, and 5 are provided in Appendix D for further information.

5.0 E&S/STORMWATER MANAGEMENT CONTROL MEASURES

The E&S control facilities proposed for the Bednarski fresh water impoundment are shown on the E&S Control Plan in Appendix A. Control measures shown on these figures are minimum controls at approximate locations to protect offsite areas from sediment-laden runoff. Additional controls may be required depending on the progress of construction and the existing conditions encountered.

5.1 SILT FENCE

Silt fence shall be installed in the approximate locations shown on the plans and in accordance with the standard detail provided. Installation requirements are provided on the standard detail included in Appendix C.

Accumulated sediments shall be removed in all cases where accumulations have reached half the above-ground height of the silt fence. If the fence has been damaged, it shall be repaired, or replaced if damaged beyond repair.

5.2 SUPER SILT FENCE

Silt fence shall be installed in the approximate locations shown on the plans and in accordance with the standard detail provided. Installation requirements are provided on the standard detail included in Appendix C.

Accumulated sediments shall be removed in all cases where accumulations have reached half the above-ground height of the silt fence. If the fence has been damaged, it shall be repaired, or replaced if damaged beyond repair.

5.3 VEGETATIVE FILTER STRIPS

A vegetative filter strip consists of a well-vegetated, grassy area below a disturbed area that can be used to remove sediment from runoff prior to its reaching waters of the Commonwealth. To be effective, runoff must be in the form of sheet flow, and the vegetative cover must be established prior to the disturbance. Due to the time required to establish vegetation and the need to control runoff from the areas disturbed while constructing filter strips, constructed vegetative filter strips are not recommended. The suitability of natural vegetative filter strips must be field verified prior to their approval.

Vegetative filter strips may be used to remove sediment from project runoff that is directed to the strip as sheet flow. In order for turnouts from the access road to function correctly, a vegetative filter strip must be constructed at the end of the turnout.

Vegetation must be an existing, well-established, perennial grass. Wooded and brushy areas are not acceptable.

If at any time, the width of the vegetative filter strip has been reduced by sediment deposition to half of its original width, suitable alternative BMPs should be installed immediately.

5.4 OUTFALL PROTECTION

Outfall protection will be installed at the end of the diversion channels as shown on the drawings in Appendix A. Outfall protection will be maintained by replacing rock that is washed away.

5.5 VEGETATIVE COVER

Vegetative cover will be established on all cut and fill slopes during the life of the impoundment. After the use of the impoundment for all associated well sites is complete, the area will be regraded, seeded and mulched. Vegetative cover capable of resisting accelerated erosion and sedimentation will be achieved. Standard seed mixtures, such as those described in the Penn State publication "Erosion Control and Conservation Plantings on "Noncropland" are recommended.

Seed mix will contain more than one variety of seed and will include the application rate. If the area to be vegetated is a steep slope (>3:1), a steep slope mixture will be used. Other limitations, such as droughty or saturated conditions, acid soils, and shaded areas will also be addressed.

Only endophyte free varieties of tall fescue will be used. Seed mixes will include a legume.

The mixes listed below are recommended, but may be substituted depending on site conditions, contractor experience, or landowner requests.

Steep Slopes (3H:1V Slope or Steeper:

Formula and Species	Percent by Weight	Minimum %		Max % Weed Seed	Seeding Rate (lbs per 1,000 sy)
		Purity	Germination		
PennDOT Formula W (Steep Slopes)					10.5 total
Tall Fescue (Festuca Arundinacea var. Kentucky 31)	70	98	85	0.15	7.5
Birdsfoot Trefoil mixture (Lotus corniculatus). A mixture of 50% Viking and 50% of either Empire, Norcen, or Leo	20	98	80*	0.10	2.0
Redtop (Agrostis alba)	10	92	80	0.15	1.0

*Recommended 10% hardseed and 70% normal sprouts. No noxious week seeds permitted.

Remaining Disturbed Areas

Formula and Species	Percent by Weight	Minimum %		Max % Weed Seed	Seeding Rate (lbs per 1,000 sy)
		Purity	Germination		
PennDOT Formula D					21.0 total
Tall Fescue (Festuca Arundinacea var. Kentucky 31)	70	98	85	0.15	15.0
Creeping Red Fescue or Chewings Fescue	30	98	85	0.15	6.0

Soil amendments shall be applied to all disturbed areas as required to establish vegetative cover. All seeding shall be mulched with hay or straw at the rate of 3 tons / acre (140 lbs. / 1,000 sq. ft.).

Where it is not possible to permanently stabilize a disturbed area immediately after the final earth moving has been completed or where the activity ceases for more than 2 weeks, interim stabilization measures shall be employed. This shall include seeding of disturbed areas with annual rye grass at a rate of approximately 40 lbs/acre and mulching with hay or straw at a rate of approximately 3 tons/acre.

6.0 PRINCIPAL/EMERGENCY SPILLWAY

The area of run-off is the drainage area upslope of the proposed fresh water impoundment. The area is approximately 7.0 acres. The run-off calculation assumes a worst-case scenario utilizing a 100-year, 5-minute peak duration storm event. The rainfall intensity was taken from the PennDOT Storm Frequency Charts for this region. The run-off calculation is as follows:

Drainage Basin:	Meadow
Area of Run-off:	7.0 acres
Rational Run-off Coefficient (C):	0.30 (conservative)
Rainfall Intensity (I):	7.0 inches/hour (100-year frequency/5 minute duration)
Peak Discharge (Q) = A * C * I =	14.7 cfs

The proposed spillway to convey this discharge is a 6-feet wide (minimum) spillway with a crest elevation 2 feet below the top of the embankment of the fresh water impoundment. Assuming the maximum runoff stage through the spillway is 1 foot, the freeboard provided is 1 foot.

The spillway design calculation is provided in Appendix E.

7.0 STAGING OF EARTHMOVING ACTIVITIES

7.1 GENERAL

The Bednarski fresh water impoundment will consist of one (1) general phase of construction. All E&S facilities shall be installed in accordance with the approved E&S/SWM Plan and the DEP Erosion and Sediment Pollution Control Program Manual dated July, 2001.

A generalized construction sequence is provided below. The construction sequence is intended to provide a general course of action in order to conform to the applicable regulatory agency requirements for temporary and permanent soil erosion and sediment pollution control. All necessary parts for proper and complete execution of work pertaining to this plan, whether specifically mentioned or not, are to be performed by the contractor. It is not intended that the drawings and this report show every detailed piece of material or equipment. The contractor shall comply with all requirements listed in this section. The contractor may be required to alter controls based on effectiveness of controls or differing conditions encountered.

7.2 SEQUENCE

1. Limits of disturbance. Stake out the limits of disturbance and note any environmental features to be protected on the site. Utilize orange construction fence or similar protective barrier around areas to be protected (if applicable). Such areas may include, but are not limited to, wetalnds, streams, and environmentally sensitive areas.
2. Earthmoving, including construction of the fresh water impoundment. Silt fence and/or super silt fence will be installed below the downslope edge of the work as appropriate. Topsoil will be stockpiled on either side of the proposed impoundment location. The fresh water impoundment will be lined with an impermeable liner.
3. Immediately after construction is completed, all disturbed areas will be seeded and mulched.
4. Install slope stabilization blankets on all embankment slopes exceeding 3H:1V.
5. Upon completion of use of the fresh water impoundment, the site will be restored to its original contour. Topsoil will be redistributed and the site returned to cropland.
6. Remove all temporary erosion and sediment control measures (silt fence, super silt fence, etc.) and any upslope diversion channels.

8.0 MAINTENANCE PROGRAM

All E&S controls shall be maintained in good working order (cleaned, repaired, etc.) until all disturbed tributary areas are stabilized. All temporary E&S controls will remain in place until the disturbed areas have been stabilized.

1. All temporary runoff E&S controls shall be inspected at least after each runoff event to maintain their effectiveness. Any damaged controls shall be repaired or replaced by the end of the working day.
2. Silt Fence and Super Silt Fence: accumulated sediments shall be removed, as required, in all cases where accumulations have reached half the height of the filter fabric. If the silt fence or super silt fence has been damaged, it shall be repaired, or replaced if damaged beyond repair. Adhere to any manufacturer's recommendations.
3. Any diversion channels shall be maintained by removing any accumulated sediment to maintain the design dimensions of the channel. Any rock lining that washes away shall be replaced.
4. Outfall protection shall be maintained by placement of additional rock as necessary following rainfall events.
5. All slopes shall be checked for signs of erosion and/or sedimentation and repaired immediately. As necessary, slopes shall be regarded and reseeded and mulched. Slope stabilization blankets may be installed as necessary.
6. All perimeter locations shall be inspected to ascertain the effectiveness of the controls. Additional control measures shall be implemented as needed.
7. During construction, sediment removed from the erosion control devices shall be disposed of by spreading it at another location on the site which is controlled by approved erosion and sedimentation controls.
8. Site entrance and exit points shall be inspected for evidence of off-site tracking of mud. It is the contractor's responsibility to clean streets of mud and/or dust and take whatever steps are necessary to keep the streets in a clean and dust-free condition.
9. Seeded and vegetated areas shall be checked so that a good stand of vegetation is maintained. Areas shall be fertilized, seeded, and mulched as they are identified. If erosion gullies have formed in vegetated areas, they will be regarded prior to fertilizing, seeding, and mulching.
10. The contractor is responsible for all maintenance and inspections.

9.0 REFERENCES

1. Commonwealth of Pennsylvania, Pennsylvania Code Title 25, Environmental Resources, Department of Environmental Protection, Chapter 93 Water Quality Standards, Harrisburg, PA, 1994.

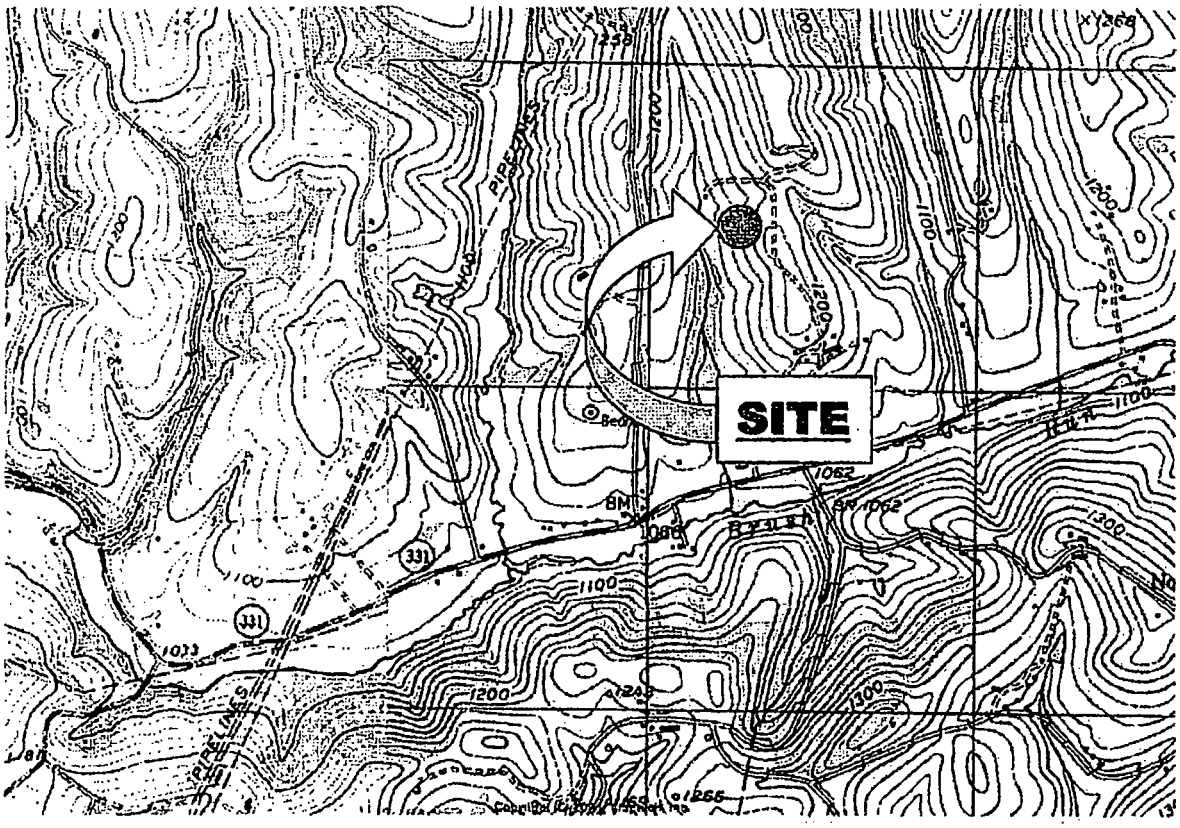
2. Commonwealth of Pennsylvania, Department of Environmental Protection, Office of Water Management, Erosion and Sediment Pollution Control Program Manual, Harrisburg, PA, July, 2001.

3. *Web Soil Survey.* Retrieved from the web at http://websoilsurvey.nrcs.usda.gov/app/, United States Department of Agriculture, Natural Resources Conservation Service, June 20, 2007.

4. Commonwealth of Pennsylvania, Department of Environmental Protection, Pennsylvania Stormwater Best Management Practices, Harrisburg, PA, December 2006.

APPENDIX A
FIGURES

Bednarski Unit Frack Pit
Hopewell Township, Washington County, PA



LOCATION MAP

WASHINGTON WEST QUADRANGLE

Scale: **1 : 24000**

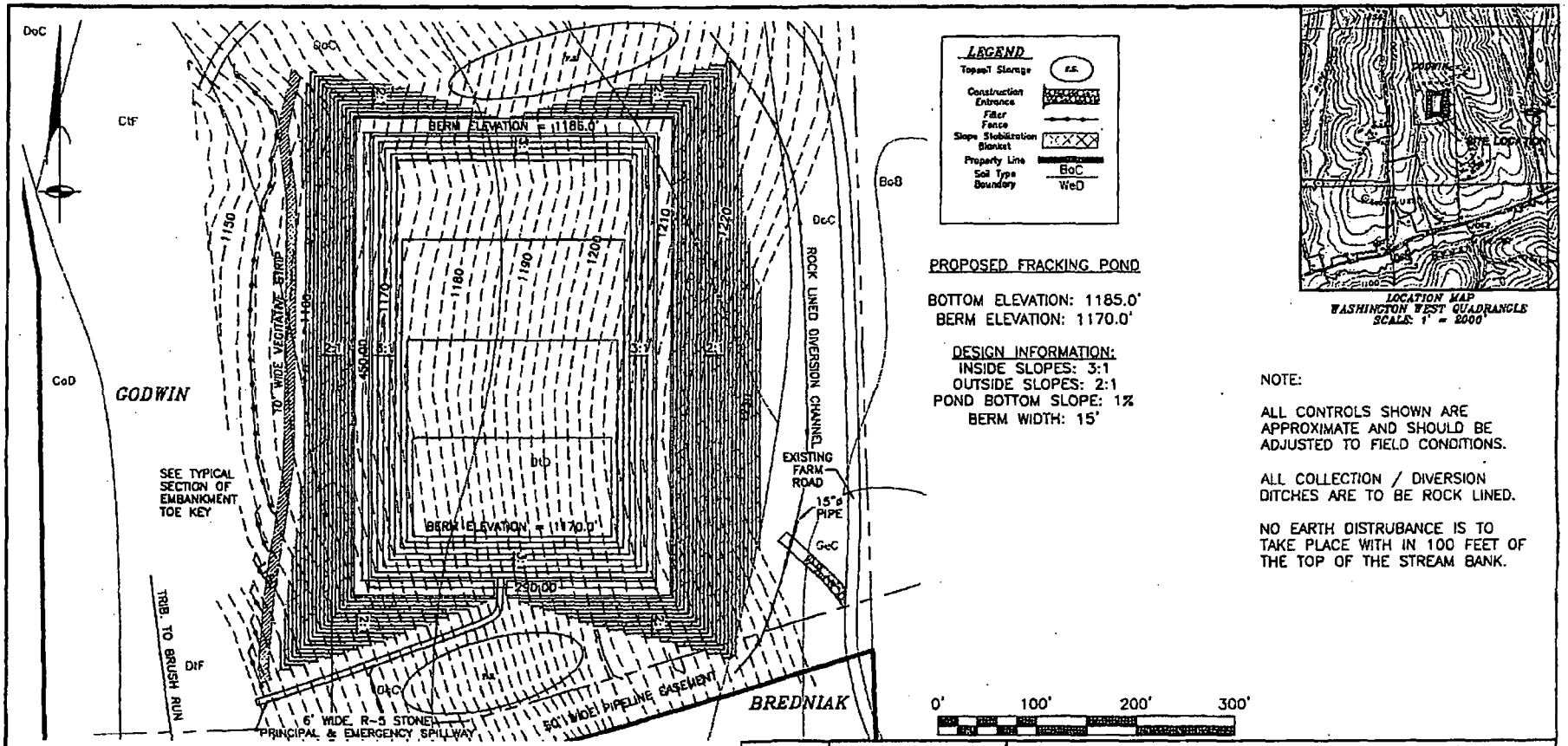
1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET
NATIONAL GOEDETIC VERTICAL DATUM OF 1929

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U.S. GEOLOGICAL SURVEY
DENVER COLORADO 80225 OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST



NOTE:

ALL CONTROLS SHOWN ARE APPROXIMATE AND SHOULD BE ADJUSTED TO FIELD CONDITIONS.

ALL COLLECTION / DIVERSION DITCHES ARE TO BE ROCK LINED.

NO EARTH DISTRUBANCE IS TO TAKE PLACE WITH IN 100 FEET OF THE TOP OF THE STREAM BANK.

STOP - CALL BEFORE YOU DIG!
PENNSYLVANIA LAW REQUIRES
THREE WORKING DAYS NOTICE
Pennsylvania One Call System, Inc.
1-800-242-1776

ACT 287 of 1974, as amended by Act 199 of 2004, requires notification by excavators, designers, or any person preparing to disturb the earth's surface anywhere in the Commonwealth call the Pa One Call System, Inc.

NOTICE REGARDING UNDERGROUND UTILITIES
No warranty is made that this plan shows all existing underground utilities or that the locations of existing utilities shown hereon are the correct locations. The depiction of utilities herein does not relieve the contractor(s) who will be performing excavations from complying with Pennsylvania law regarding excavations, said requirements can be satisfied, in part, by contacting the POCS at 1-800-242-1776.

NOTICE
If site conditions encountered during construction differ from those shown on this plan, contact TRI-COUNTY ENGINEERING at (724) 832-8814 before proceeding further.

REVISED	COMMENTS

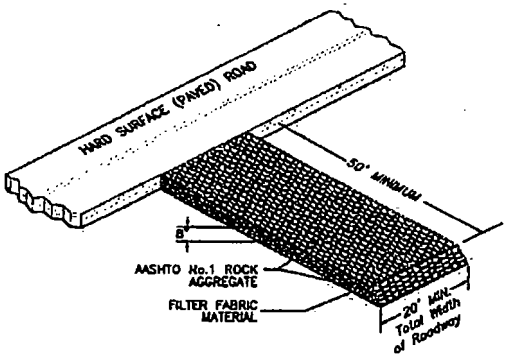
TRI - COUNTY ENGINEERING, LLC
820 SOUTH MAIN STREET
GREENSBURG, PA. 15601
VOICE: 724 / 832-8814
FAX: 724 / 834-4128

Innovative Engineering Solutions Since 1978

PROPOSED FRACKING POND
BEDNARSKI UNIT

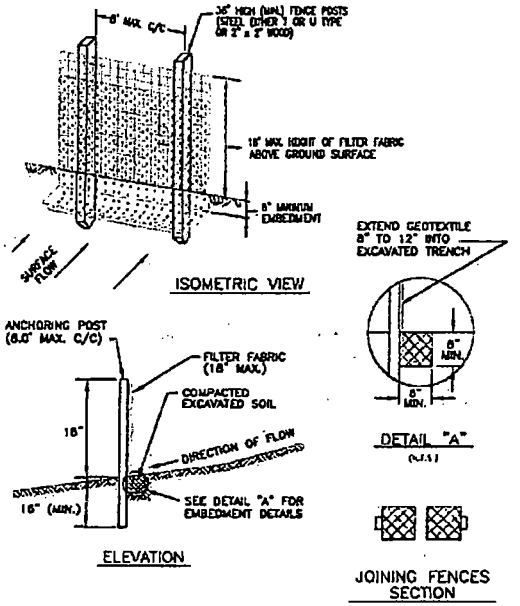
RANGE RESOURCES - APPALACHIA LLC

DRAWN BY:	DATE:	HOPEWELL TOWNSHIP
RAM	9/24/08	WASHINGTON COUNTY
SCALE: 1" = 100'	SHEET: E&S-1	FILE NO.: 1768-83



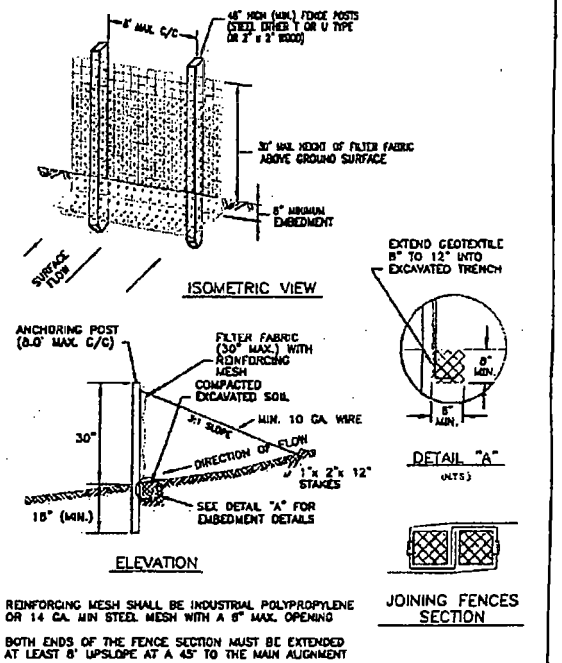
S 1 CONSTRUCTION ENTRANCE

(N.T.S.)



S 2 18" SILT FENCE

(N.T.S.)



S 2A 30" SILT FENCE

(N.T.S.)

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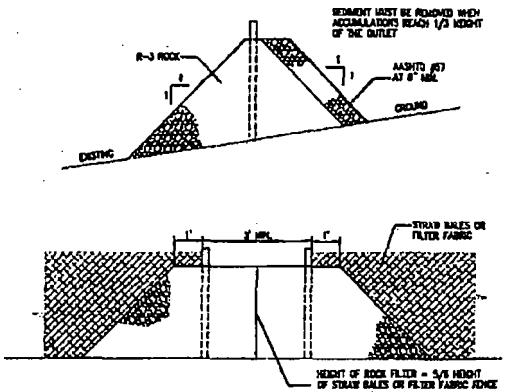


S/3 ROCK FILTER OUTLET
(N.T.S.)

8. Pumped Water Filter Bags may be used to filter water pumped from disturbed areas prior to discharging to waters of the Commonwealth. They may also be used to filter water pumped from the sediment storage areas of Sediment Basins and Traps.

A. DESIGN RESTRICTIONS

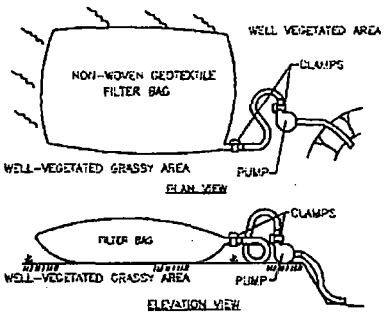
1. Filter bags should be capable of trapping particles larger than 150 microns.
2. The Pumping Rate should not exceed the design maximum pumping rate specified by the manufacturer but in no case shall exceed a rate of 750 gallons per minute.
3. A suitable means of accessing the bag with machinery for purposes of disposal should be provided.
4. Filter Bags should not be placed on any slope greater than 5%.
5. Filter bags should discharge onto stable, erosion resistant areas.

B. INSTALLATION

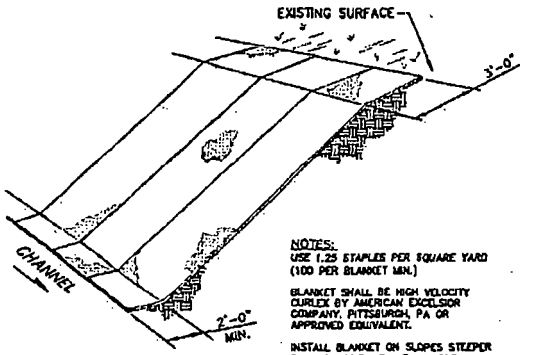
1. Filter bags should be installed in accordance with the manufacturer's specifications.
2. The Pump Discharge Hose should be inserted into a corner of the bag and securely clamped prior to initiating pumping.

C. MAINTENANCE

1. At minimum, Filter Bags should be inspected Daily and After Each Runoff Event to ensure that they are working properly.
2. If any problem is detected, Pumping Should Cease Immediately and not resume until the problem is corrected.



S/4 GEOTEXTILE FILTER BAG



NOTES:
USE 1.25 STAPLES PER SQUARE YARD (100 PER BLANKET MIN.)

BLANKET SHALL BE HIGH VELOCITY CURLEX BY AMERICAN EXCELSIOR COMPANY, PITTSBURGH, PA OR APPROVED EQUIVALENT.

INSTALL BLANKET ON SLOPES STEEPER THAN 3 HORIZONTAL TO 1 VERTICAL

S/5 EROSION CONTROL BLANKET INSTALLATION
(N.T.S.)

STOP - CALL BEFORE YOU DIG!
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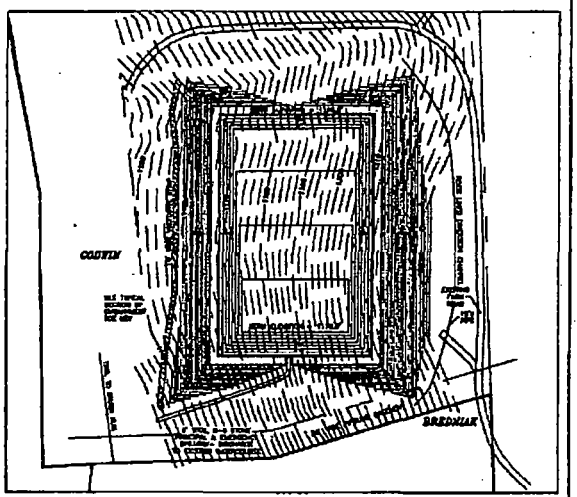
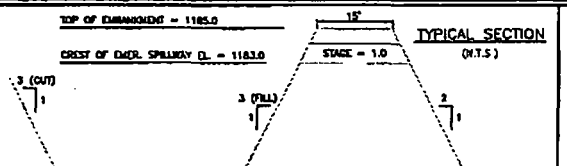
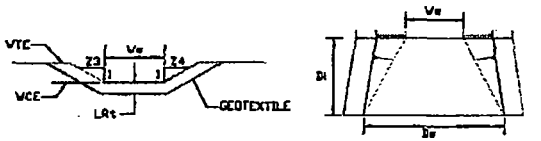
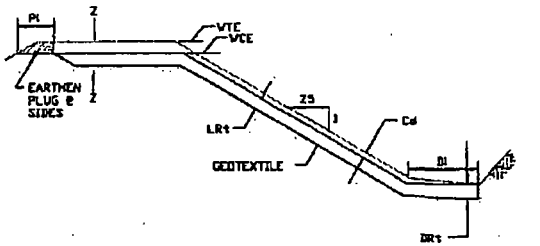
SCALE: N.T.S.	SHEET E&S-3	FILE NO. 1769-83



S 6 FRACKING POND





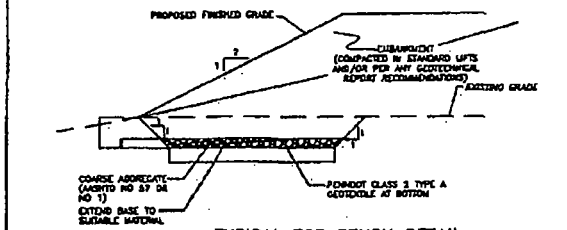


THE CHANNEL SECTION OF THE EMERGENCY SPILLWAY SHALL BE LINED WITH: R-3 (MIN.) RIPRAP

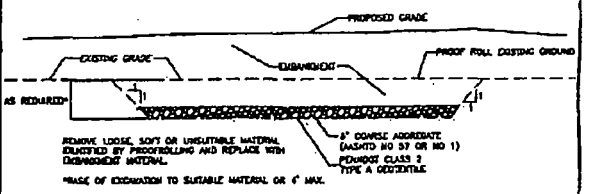
BASIN NO.	WDR Z3 (FT)	WDR Z4 (FT)	WDR TOP ELEV VTE (FT)	WDR CREST ELEV WCE (FT)	WDR WIDTH Ww (FT)	LINING RIPRAP SIZE (R-)	LINING RIPRAP THICK. LRt (IN)	CHANNEL Z3 (FT)	CHANNEL DEPTH Cd (FT)	DISSIPATER LENGTH Di (FT)	DISSIPATER WIDTH Dw (FT)	DISSIPATER RIPRAP SIZE (R-)	DISSIPATER RIPRAP THICK. DRt (IN)
1	3	3	1183.0	1183.0	5	3	27	6.3	1	20	34	R-3	27

* Dimension Pl should be 0' minimum.

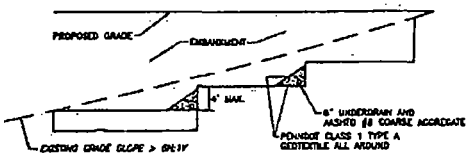
S 6A FRACKING BASIN EMERGENCY SPILLWAY (N.T.S.)



TYPICAL TOE BENCH DETAIL
N.T.S.



OVER-EXCAVATION OF UNSUITABLE MATERIALS DETAIL
N.T.S.



NOTE:
CONTRACTOR TO VERIFY THAT THE UNDERDRAIN PIPE IS ADEQUATELY SIZED ONCE GROUNDWATER CONDITIONS ARE REVEALED

S 6B TYPICAL KEY BENCH DETAIL
N.T.S.

STOP - CALL BEFORE YOU DIG!
PENNSYLVANIA LAW REQUIRES
THREE WORKING DAYS NOTICE
Pennsylvania One Call System, Inc.
1-800-242-1776

ACT 287 of 1974, as amended by Act 199 of 2004, requires notification by excavators, designers, or any person preparing to disturb the earth's surface anywhere in the Commonwealth call the Pa One Call System, Inc.

NOTICE REGARDING UNDERGROUND UTILITIES
No warranty is made that this plan shows all existing underground utilities or that the locations of existing utilities shown hereon are the correct locations. The depiction of utilities herein does not relieve the contractor(s) who will be performing excavations from complying with Pennsylvania law regarding excavations, said requirements can be satisfied, in part, by contacting the PDCS at 1-800-242-1776.

NOTICE
If site conditions encountered during construction differ from those shown on this plan, contact TRI-COUNTY ENGINEERING at (724) 832-8814 before proceeding further.

REVISED	COMMENTS

TRI - COUNTY ENGINEERING, LLC
820 SOUTH MAIN STREET
GREENSBURG, PA. 15601
VOICE: 724 / 832-8814
FAX: 724 / 834-4128

Innovative Engineering Solutions Since 1979

PROPOSED FRACKING POND
BEDNARSKI UNIT

RANGE RESOURCES - APPALACHIA LLC

DRAWN BY:	DATE:	HOPEWELL TOWNSHIP
RAM	9/24/08	WASHINGTON COUNTY
SCALE: N.T.S.	SHEET: E&S-4	FILE NO.: 1769-83

APPENDIX B
SOILS FIGURES

Soil Map--Greene and Washington Counties, Pennsylvania
(Bednarski Unit Frack Pond)

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features

Municipalities
- Cities
- Urban Areas

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails

Roads
- Interstate Highways
- US Routes
- State Highways
- Local Roads
- Other Roads

MAP INFORMATION

Original soil survey map sheets were prepared at publication scale. Viewing scale and printing scale, however, may vary from the original. Please rely on the bar scale on each map sheet for proper map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 17N

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Greene and Washington Counties, Pennsylvania
Survey Area Data: Version 4, Feb 1, 2008

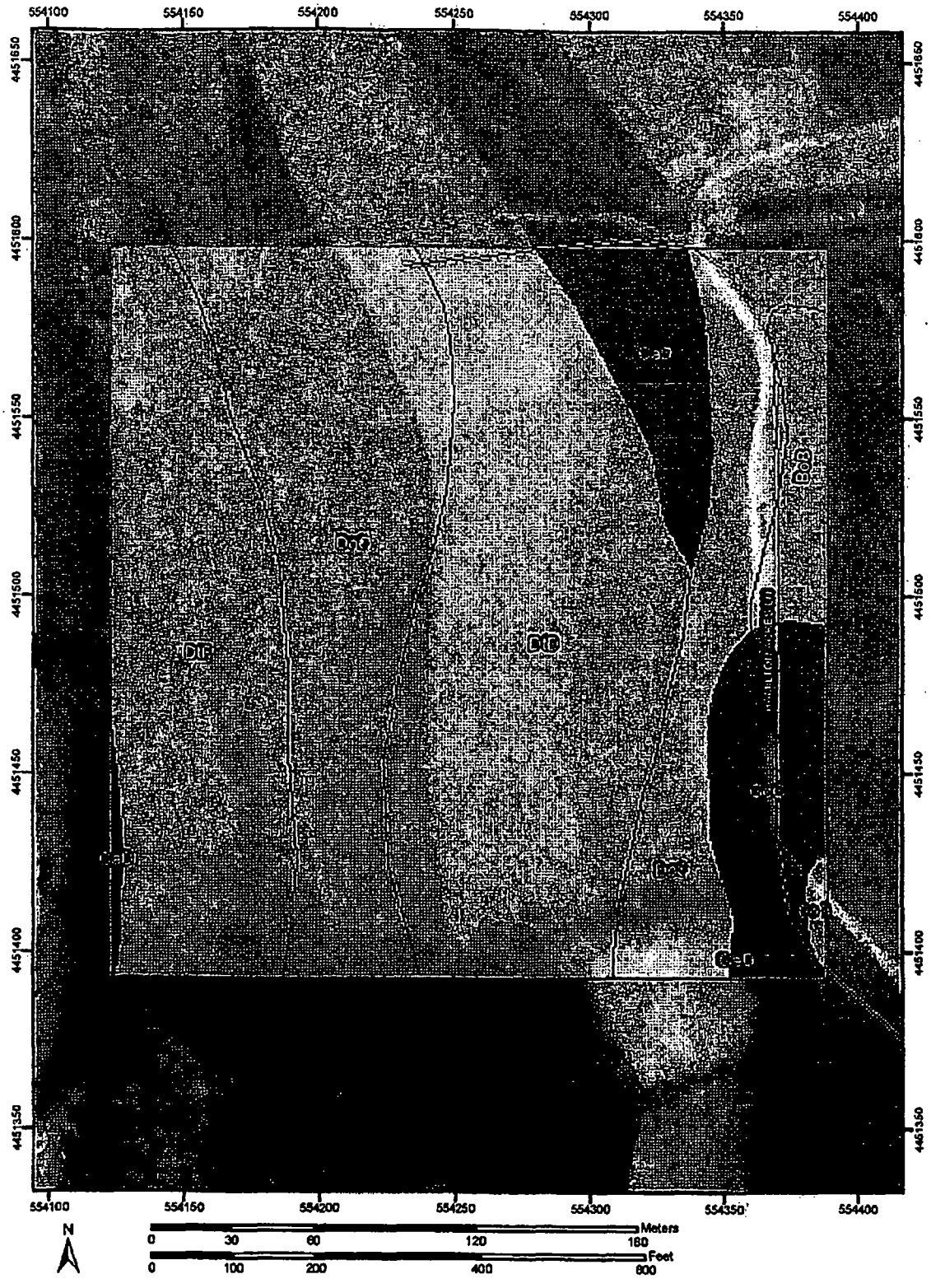
Date(s) aerial images were photographed: 4/7/1993

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Greene and Washington Counties, Pennsylvania (PA611)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BoB	Brooke silty clay loam, 3 to 8 percent slopes	0.7	3.7%
CaD	Culleoka silt loam, 15 to 25 percent slopes	1.0	5.4%
DoC	Dormont silt loam, 8 to 15 percent slopes	5.8	32.5%
DtD	Dormont-Culleoka silt loams, 15 to 25 percent slopes	5.5	30.7%
DtF	Dormont-Culleoka silt loams, 25 to 50 percent slopes	3.7	20.9%
GeC	Guernsey silt loam, 8 to 15 percent slopes	1.2	6.7%
GeD	Guernsey silt loam, 15 to 25 percent slopes	0.0	0.1%
Totals for Area of Interest (AOI)		17.9	100.0%

Embankments, Dikes, and Levees–Greene and Washington Counties, Pennsylvania
(Bednarski Unit Frack Pond)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Soil Ratings
- Very limited
- Somewhat limited
- Not limited
- Not rated or not available

Political Features

Municipalities
- Cities
- Urban Areas

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails

Roads
- Interstate Highways
- US Routes
- State Highways
- Local Roads
- Other Roads

MAP INFORMATION

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Date(s) aerial images were photographed: 4/7/1993

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Embankments, Dikes, and Levees

Embankments, Dikes, and Levees— Summary by Map Unit — Greene and Washington Counties, Pennsylvania						
Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (rating values)	Acres in AOI	Percent of AOI
BoB	Brooke silty clay loam, 3 to 8 percent slopes	Somewhat limited	Brooke (100%)	Thin layer (0.86)	0.7	3.7%
				Hard to pack (0.11)		
CaD	Culleoka silt loam, 15 to 25 percent slopes	Very limited	Culleoka (80%)	Piping (1.00)	1.0	5.4%
				Thin layer (0.83)		
DoC	Dormont silt loam, 8 to 15 percent slopes	Somewhat limited	Dormont (70%)	Depth to saturated zone (0.75)	5.8	32.5%
				Piping (0.43)		
DtD	Dormont-Culleoka silt loams, 15 to 25 percent slopes	Somewhat limited	Dormont (45%)	Depth to saturated zone (0.75)	5.5	30.7%
				Piping (0.43)		
DtF	Dormont-Culleoka silt loams, 25 to 50 percent slopes	Somewhat limited	Dormont (55%)	Depth to saturated zone (0.75)	3.7	20.9%
				Piping (0.35)		
GeC	Guernsey silt loam, 8 to 15 percent slopes	Very limited	Guernsey (80%)	Depth to saturated zone (1.00)	1.2	6.7%
				Hard to pack (0.04)		
				Thin layer (0.01)		
GeD	Guernsey silt loam, 15 to 25 percent slopes	Very limited	Guernsey (75%)	Depth to saturated zone (1.00)	0.0	0.1%
				Hard to pack (0.04)		
				Thin layer (0.01)		
Totals for Area of Interest (AOI)					17.9	100.0%

Embankments, Dikes, and Levees— Summary by Rating Value		
Rating	Acres in AOI	Percent of AOI
Somewhat limited	15.7	87.8%
Very limited	2.2	12.2%

Description

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. Embankments that have zoned construction (core and shell) are not considered. The soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the suitability of the undisturbed soil for supporting the embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the specified use. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Rating Options

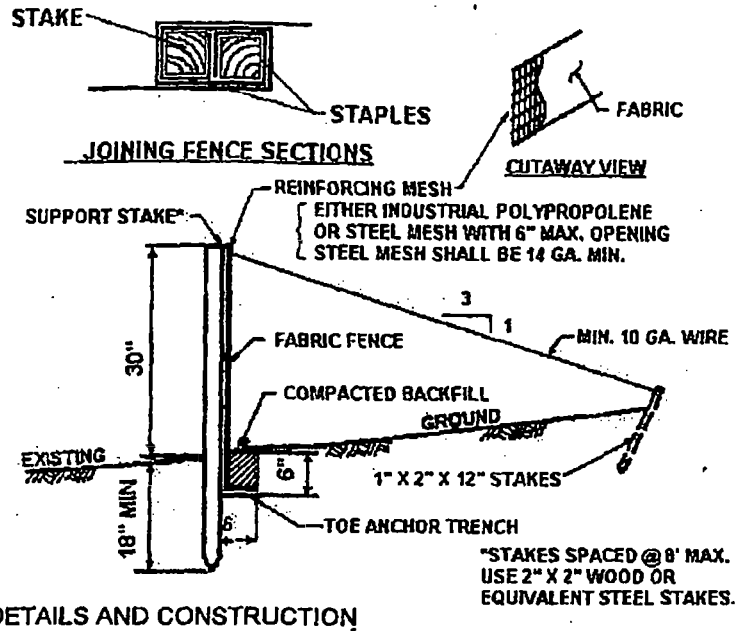
Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

APPENDIX C
STANDARD CONSTRUCTION DETAILS

STANDARD CONSTRUCTION DETAIL # 20
Reinforced Filter Fabric Fence (30" High)



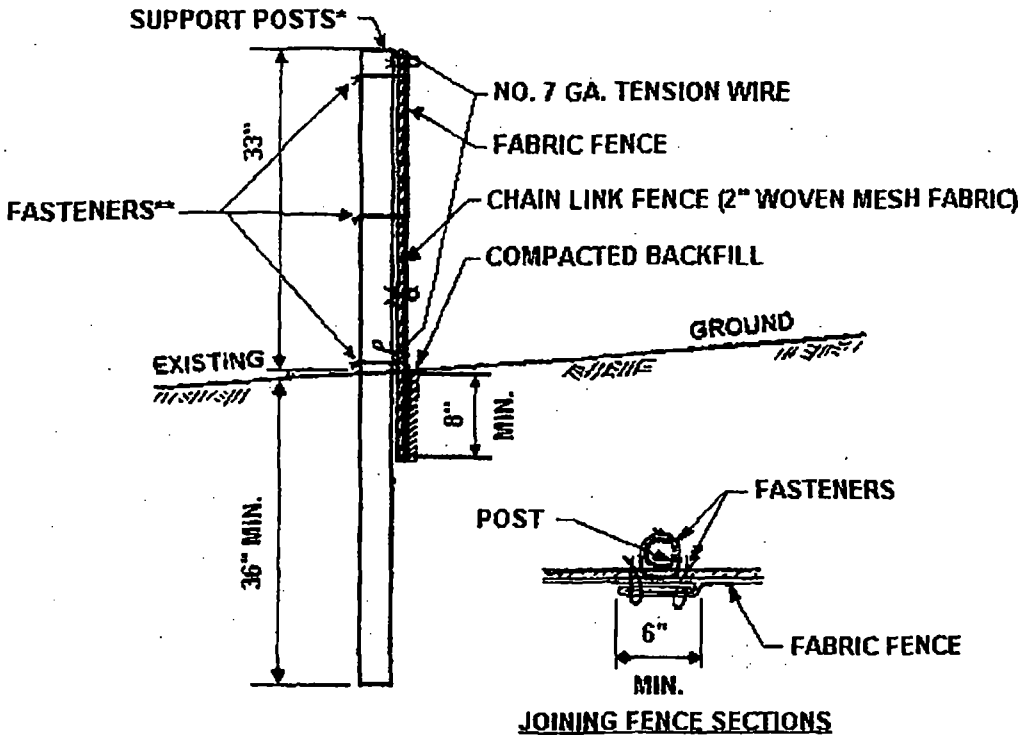
NOTE: SHOW ALL DETAILS AND CONSTRUCTION DIMENSIONS ON PLAN DRAWINGS.

Filter fabric fence must be installed at existing level grade. Both ends of each fence section must be extended at least 8 feet upslope at 45 degrees to the main fence alignment.

Sediment must be removed where accumulations reach 1/ 2 the above ground height of the fence.

Any fence section which has been undermined or topped must be immediately replaced with a rock filter outlet. See Standard Construction Detail # 18.

STANDARD CONSTRUCTION DETAIL # 22
Super Filter Fabric Fence



*** Posts spaced @ 10' max. Use 2 1/2" dia. galvanized or aluminum posts.**

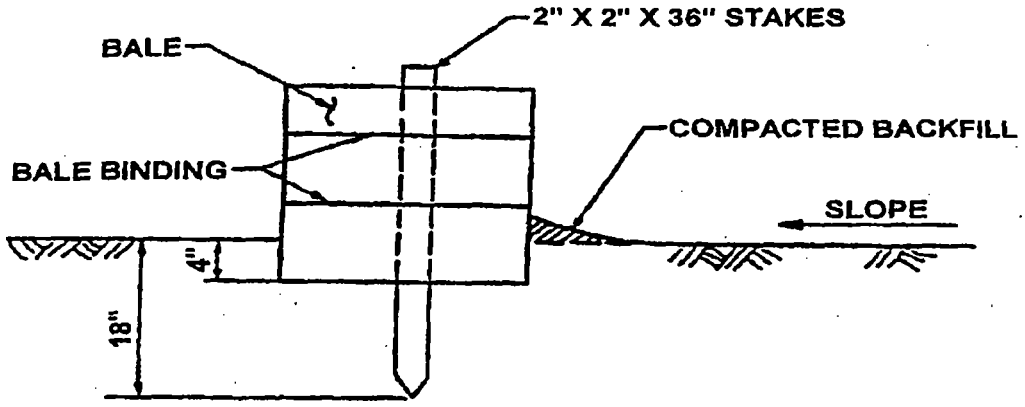
**** Chain Link To Post Fasteners spaced @ 14" max. Use No. 6 Ga. aluminum wire or No. 9 galvanized steel pre-formed clips. Chain Link To Tension Wire Fasteners spaced @ 60" max. Use No. 10 Ga. galvanized steel wire. Fabric To Chain Fasteners spaced @ 24" max. C to C.**

No. 7 Ga. Tension Wire installed horizontally at top and bottom of chain-link fence.

Filter Fabric Fence must be placed at existing level grade. Both ends of the barrier must be extended at least 8 feet upslope at 45 degrees to main barrier alignment.

Sediment must be removed when accumulations reach 1/ 2 the above ground height of the fence.

STANDARD CONSTRUCTION DETAIL #17
Straw Bale Barriers



Straw Bale Barriers should not be used for more than 3 months.

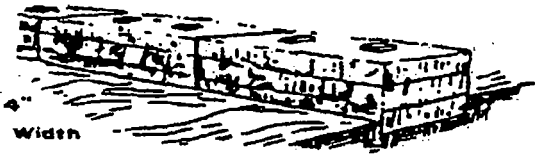
Straw Bale Barriers shall be placed at existing level grade. Both ends of the barrier shall be extended at least 8 feet up slope at 45 degrees to the main barrier alignment.

Sediment shall be removed when accumulations reach 1/3 the above ground height of the barrier.

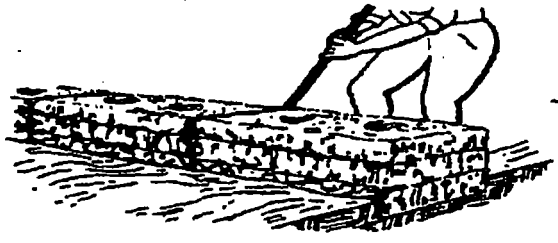
Any section of Straw Bale Barrier which has been undermined or topped shall be immediately replaced with a Rock Filter Outlet. See Standard Construction Detail #18.

1. EXCAVATE THE TRENCH.

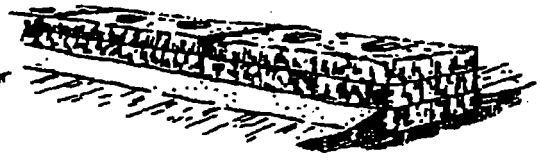
2. PLACE AND STAKE STRAW BALES.



2. WEDGE LOOSE STRAW BETWEEN BALES.



4. BACKFILL AND COMPACT THE EXCAVATED SOIL. (ANCHOR TOE)



APPENDIX D
STORMWATER BMP MANUAL
WORKSHEETS 3, 4, AND 5

Worksheet 3: Nonstructural BMP Credits

PROTECTED AREA

1.1 Area of Protected Sensitive/Special Value Features (see WS 2) 0 Ac.

1.2 Area of Riparian Forest Buffer Protection 0 Ac.

3.1 Area of Minimum Disturbance/Reduced Grading 0 Ac.

TOTAL 0 Ac.

Site Area	*minus*	Protected Area	=	Stormwater Management Area
7.3	-	0	=	7.3

This is the area that requires stormwater management

VOLUME CREDITS

3.1 Minimum Soil Compaction

Lawn _____ ft² x 1/4" x 1/12 = _____ ft³

Meadow _____ ft² x 1/3" x 1/12 = _____ ft³

3.3 Protect Existing Trees

For Trees within 100 feet of impervious area:

Tree Canopy _____ ft² x 1/2" x 1/12 = _____ ft³

_____ _____

5.1 Disconnect Roof Leaders to Vegetated Areas

For runoff directed to areas protected under 5.8.1 and 5.8.2

Roof Area _____ ft² x 1/3" x 1/12 = _____ ft³

For all other disconnected roof areas

Roof Area _____ ft² x 1/4" x 1/12 = _____ ft³

5.2 Disconnect Non-Roof Impervious to Vegetated Areas

For Runoff directed to areas protected under 5.8.1 and 5.8.2

Impervious Area _____ ft² x 1/3" x 1/12 = _____ ft³

For all other disconnected roof areas

Impervious Area _____ ft² x 1/4" x 1/12 = _____ ft³

0

** For use on Worksheet 5*

WORKSHEET 4 - CHANGE IN RUNOFF VOLUME FOR 2-YR STORM EVENT

PROJECT: Bednarski Impoundment
Drainage Area:
2-Year Rainfall: 2.6 in

Total Site Area: 7.3 acres
Protected Site Area: 0 acres
Managed Area: 7.3 acres

$S = \left(\frac{1000}{CN}\right) - 10$

Existing Conditions:

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft³)
Woodland								
Meadow	C	317,988	7.3	70	4.29	0.86	0.50	13,331
Impervious								
TOTAL:		317,988	7.3					13,331

Developed Conditions:

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft³)
Meadow	C	65,340	1.5	82	2.19	0.44	1.07	5,826
Impoundment/Cut Slope	C	252,648	5.8	0	0	0	0	0
TOTAL:		317,988	7.3					5,826

2-Year Volume Increase (ft3): 0

2-Year Volume Increase = Developed Conditions Runoff Volume - Existing Conditions Runoff Volume

1. Runoff (in) = $Q = (P - 0.2S)^2 / (P + 0.8S)$ where

$$Q_{pre} = \frac{(2.6 - 0.2(4.29))^2}{(2.6 + 0.8(4.29))} = 0.50$$

P = 2-Year Rainfall (in)

S = (1000/ CN)-10

$$Q_{post} = \frac{(2.6 - 0.2(2.19))^2}{(2.6 + 0.8(2.19))} = 1.07$$

2. Runoff Volume (CF) = Q x Area x 1/12

Q = Runoff (in)

Area = Land use area (sq. ft)

Note: Runoff Volume must be calculated for EACH land use type/condition and HSGI. The use of a weighted CN value for volume calculations is not acceptable.

WORKSHEET 5: STRUCTURAL BMP VOLUME CREDITS

PROJECT: Bednarski Fresh Water Impoundment
SUB-BASIN: —

Required Control Volume (ft^3) - *from Worksheet 4*: -7,505
Non-structural Volume Credit (ft^3) - *from Worksheet 3*: - 0

Structural Volume Reqmt (ft^3) -7,505
(Required Control Volume minus Non-structural Credit)

Proposed BMP		Area (ft^2)	Storage Volume (ft^3)
6.4.1	Porous Pavement		
6.4.2	Infiltration Basin		
6.4.3	Infiltration Bed		
6.4.4	Infiltration Trench		
6.4.5	Rain Garden/Bioretention		
6.4.6	Dry Well / Seepage Pit		
6.4.7	Constructed Filter		
6.4.8	Vegetated Swale		
6.4.9	Vegetated Filter Strip		
6.4.10	Berm		
6.5.1	Vegetated Roof		
6.5.2	Capture and Re-use		
6.6.1	Constructed Wetlands		
6.6.2	Wet Pond / Retention Basin		
6.6.3	Dry Extended Detention Basin		
6.6.4	Water Quality Filters		
6.7.1	Riparian Buffer Restoration		
6.7.2	Landscape Restoration / Reforestation		
6.7.3	Soil Amendment		
6.8.1	Level Spreader		
6.8.2	Special Storage Areas		
Other			

Total Structural Volume (ft^3): 0
Structural Volume Requirement (ft^3): 0

DIFFERENCE 0

APPENDIX E
RECORD OF EXPERIENCE

STANDARD WORKSHEET #2
RECORD OF TRAINING AND EXPERIENCE
IN EROSION AND SEDIMENTATION CONTROL METHODS AND TECHNIQUES

NAME OF PLAN PREPARER: Carla L. Suszkowski, P.E.

FORMAL EDUCATION:

Name of College of Technical Institute: University of Pittsburgh
Curriculum or program: Civil Engineering
Dates of Attendance: From: 9/88 **to:** 4/92
Degree received: BS, Civil Engineering – 1992

OTHER TRAINING:

Name of Training: Advanced Design Methods for Selecting E&S Control BMPs
Presented by: International Erosion Control Association
Date: 1996

EMPLOYMENT HISTORY:

Current Employer: Range Resources – Appalachia, LLC
Telephone: (724) 873 - 3226

Former Employer: Civil & Environmental Consultants, Inc.
Telephone: (412) 429 - 2324

RECENT EROSION AND SEDIMENTATION CONTROL PLANS PREPARED:

Name of Project	Morgan AM&T Captive Disposal Area Parking Lot	Phoenix Resources, Inc. C&D Landfill	Mostoller Landfill, Inc. Clay Borrow Area
County:	Potter	Tioga	Somerset
Municipality:	Eulalia Township	Duncan Township	Somerset and Brothers Valley Townships
Permit Number: (If Applicable)			
Approving Agency:	PaDEP	PaDEP	PaDEP

APPENDIX F
SPILLWAY CALCULATION

Basin #1 Emergency Spillway Discharge Capacity

Project :	Bednarski Unit Frack Pond	**Job No. :**	GLE1769-83
Location :	Hopewell Township, Washington County, PA	**Date :**	24-Sep-08
Prepared by :	RAM	**Page :**	1 of 1

Weir Flow	$Q = C L H^{1.5}$	Q = Discharge in cu.ft.	**17.4**
	C = Weir Coefficient	2.9	
	L = Weir Length	6.0	
	H = Head above Weir Crest	1.0	

Principal Spillway Capacity (sum of temporary and permanent risers) = **N/A**

TOTAL OUTFLOW= 17.4